AUDITORY COMMUNICATION IN EDUCATION OF THE BLIND

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The problems of blind students in gaining access to the information required by present day school curricula are manifold. We are all familiar with the difficulties in procurement of materials in Braille, large type, or recorded form. The bulk of books, the weight and bulk of recording equipment and the cost of all these have long been a matter of concern. Once these problems are solved, it is still necessary to transfer the information from the book or record to the mind of the student and this is a process with many problems of its own.

When we examine the results of studies (16, 18) of Braille reading, we find that communication rates are distressingly slow. For high school seniors, Braille reading rates average about 90 words per minute (wpm) as compared to 250 wpm for print readers. Through greater understanding of the perceptual factors involved in Braille reading and through development of special training methods, we may be able to increase Braille reading speeds. Research on both these problems is currently underway at the American Printing House and we are hopeful of the outcomes. In addition to Braille, the blind possess another communications channel of high potential. This is the auditory channel. It is the purpose of this paper to describe some research findings in this area and explore some problems in the use of this channel of communication in the education of blind children.

Measures of auditory communication rates reveal that they are more rapid than those associated with Braille. For example, many Talking Books are recorded at a rate of 175 wpm which is almost double that for Braille. Even higher auditory word rates have been attained through techniques developed by Fairbanks and his

collaborators (7). These make it possible to increase the word rate of a recording without altering its other characteristics. Using this technique (8), these researchers found little drop in comprehension for auditory material presented at rates as high as 282 wpm. Rapid auditory communication of this type appears to have potential for the education of the blind and some exploratory studies of this potential have been made.

The first of these was by Iverson (14) who described opinions of high school students who listened to stories which were speeded by 25 percent and 50 percent. Many students stated that they had trouble detecting 25 percent compression and that they believed 35 percent compression would be suitable for Talking Books. All students were of the opinion that reproduction at 25 percent compression was superior to listening to 33 rpm records played at 45 rpm. Enc and Stolurow (6) used blind students in a comparison of both immediate retention and retention after 24 hours for 10 stories presented at both "slow" and "fast" rates. Rates for "slow" stories ranged from 127-183 wpm and those for "fast" stories ranged from 193-232 wpm. Speeds of the stories were achieved by adjusting the speech rate of the reader. The results showed that for both immediate and delayed recall, those who listened to "fast" rates earned greater retention scores than those who listened at the slower rates when test score per minute of listening time served as a criterion.

Last year, the American Printing House and the University of Louisville collaborated in further study (1) of this subject. Groups of blind children in grades 6, 7 and 8 were exposed to materials representing those commonly found in 7th grade literature and science texts. Some groups read the material in Braille and others listened to it at rates of 175, 225, 275 or 375 words per minute. Immediately after exposure, comprehension for the materials was measured by multiple-choice tests. Analysis of the results showed no significant difference in comprehension for literary material when presented through Braille reading or

listening at 225 wpm. For scientific material, there was no significant difference between comprehension achieved through Braille reading and that achieved through listening at 275 wpm. Students in the study read the Brailled literary material at 70 wpm and the Brailled scientific material at 57 wpm. Therefore, with no loss in comprehension, efficiency of communication was increased by a factor of more than 3 for the literary material and by a factor of almost 5 for the scientific material.

All studies of comprehension of rapid speech have shown that comprehension falls off at rates in excess of 275-282 wpm. However, all these studies have utilized subjects who had no previous experience in listening to rapid speech. A recent study by Voor (22) indicates that comprehension does improve with experience. He exposed 50 college students to five short stories recorded at 380 wpm. At least 24 hours separated each presentation. Comprehension was tested immediately after exposure. A significant increase in comprehension of about 17% was obtained. The findings lead to a question - What are the upper limits for learning to comprehend compressed speech?

Research on listening at normal word rates demonstrates that a number of factors effect listening comprehension. Intelligence is an important variable in this respect. Kramar (15), using the Brown-Carlsen Listening Comprehension Test as a criterion of listening ability, reports correlations of .54 with the Wechsler-Bellevue Intelligence Test and .55 with the A. C. E. Intelligence Tests. In similar studies a correlation of .66 between intelligence and listening for grade six pupils and Hollow (13) found this relationship to be .42 for students in grade five. In a study of approximately 500 pupils in grades 4-8, Caughran (3) found that growth in comprehension through listening showed steady progressive development from mental ages eleven through sixteen.

Difficulty of material is related to listening comprehension. Carver (2) used college students and adults in studying listening comprehension for a variety of materials. He found that the effectiveness of listening was greater when

material was simpler (p. 177-178). Hampleman (11) in studying listening comprehension for materials from the Durrell-Sullivan Reading Achievement Test found that easy material was more readily comprehended than hard material by fourth and sixth grade pupils, both girls and boys. The validity of indices of reading difficulty for predicting level of listening difficulty has not been established. Chall and Dale (4) graded difficulty of eighteen newscast scripts using the Dale-Chall and Flesch formulas. They interpret their results as demonstrating that these formulas predict three levels of listening difficulty (easy, medium, and hard) for college freshmen. Contradictory results were obtained by Manion (17) who correlated indices obtained from the Lorge, Flesch, and Dale-Chall formulas with three criteria of listener difficulty for college sophomores and obtained no significant relationships.

Harrell, Brown, and Schramm (12) have demonstrated that length of material is also related to comprehension by listening. They presented 12.5 minute newscasts containing 20, 30, and 40 items to groups of military personnel. Not only did subjects prefer newscasts of 20-30 items but they also remembered fewer items as the number of items increased from 20 to 40.

One author (2) states that certain types of mental functions, i.e., recognition, verbatim recall, and suggestibility are more successfully exercised while listening. Visual and auditory response modes facilitate other mental functions exclusive of these. In the same study, the author reports that familiar and meaningful material is comprehended more readily through listening than strange or meaningless material.

The task of determining upper limits for rapid speech appears much more complex once variables related to listening comprehension generally are considered. Whether the relationships found for normal rates of speech hold for rapid speech is a question requiring exploration. If such relationships do hold for speeded speech, then the problem becomes one of establishing upper limits under a variety

of probable conditions. Once upper limits for comprehension of rapid speech are set, a subsidiary problem is designing training methods which will enable people to reach these limits efficiently. I.Q., M.A., difficulty of material and other factors, all have important implications for the quality of training achieved.

When the upper limits for comprehension of speeded speech are defined and methods developed for teaching people to reach these limits, research should be undertaken to answer a third question of relevance to education of the blind. How does learning achieved through rapid speech compare with that achieved through normal speech or reading?

Three studies have been made comparing learning achieved through listening with that achieved through Braille reading. Lowenfeld (16) compared comprehension of children in grades 3, 4, 6, and 7 for lessons presented in Braille and recorded form. Reading of Braille material took three times as long as listening. Comprehension of recorded material was significantly superior to that for Braille materials for children in grades 3 and 4. For grades 6 and 7, no difference was found for comprehension of stories, while comprehension of textbook material was significantly greater for Braille reading. In the joint APH-UL (1) study described earlier, equal comprehension was obtained for materials presented in Braille and at normal speech rates. In a recent study, the speaker (19) had matched groups of subjects in grades 6-12 read in Braille or listen, at normal rates, to a short passage of scientific material for 2, 4, and 5 consecutive days. On the final day a comprehension test was administered. No differences were found in amounts of learning achieved by these two methods.

The comparison of learning achieved through listening at normal speech rates with that achieved through visual reading has been made intermittently over the last seven decades. In a review of the findings of research on this topic, Witty and Sizemore (23) summarize the situation as follows: "It seems fair to conclude that learning, of course, is possible under either the visual or auditory approach

and that the variations which are found in results may be accounted for by factors such as individual differences in experience and ability, variation in the nature of the materials presented, and the nature of the testing or evaluative instruments employed. Moreover, it appears that from some studies we may conclude that improvement in learning efficiency may be heightened by judicious use of a combination of methods of presentation."

Mental ability as expressed by M.A. scores is one variable which appears to be involved in relative effectiveness of reading and listening. Caughran (3) administered equivalent forms of a standardized reading test to 501 pupils in grades 4 through 8. These forms were adapted for oral, visual, and visual-oral presentation. Listening comprehension was found to be greater than reading comprehension for students in the M.A. range of 10-13.5 years. Reading comprehension was greater for pupils in the M.A. range of 13.5-16 years. Combined reading-listening provided most comprehension for M.A. ranges of 11-15 years. Hampleman (11) found listening comprehension significantly superior to reading comprehension for students in grades 4 and 6, however, the extent of these differences decreased with M.A.

Grade level is another variable related to the relative efficiency of learning by reading and listening. Russell (21) exposed matched groups (I.Q.) of children in grades 5, 7, and 9 to two presentations through listening or reading of a 1000 word composition on the mongoose. A "distinct superiority" in favor of listening comprehension was found for grade 5 pupils, comprehension for the methods was equal at grade 7; and some evidence of superiority of reading over listening was found at grade 9. Younger children (ages 6-9) appear to learn more through auditory means than visual means according to Conway (5). However, a reversal occurs for children from ages 9-14 in that reading comprehension becomes superior. Somewhat in contrast with these findings are those of Hampleman (11) who found listening comprehension superior to reading comprehension for pupils in grades 4 and 6.

The existence of sex differences in comprehension by reading and listening

has been reported in the literature. However, findings are contradictory. Conway (5) reports auditory memories of girls superior to boys except at age twelve where they are equal. Hampleman (11) reports sex groups equal in comprehension, except for difficult material which boys comprehended better than girls.

The relative effectiveness of reading and listening comprehension is dependent on difficulty of material. Carver (2) presented a variety of passages of meaningful material to college students and other adults. He states, "The easier the material, the greater is the likelihood that auditory presentation will be more effective than visual. Materials of average difficulty tend to give equivocal results; whereas, in general, material that is intrinsically difficult is better comprehended if presented to the eye." Similar results have been obtained by other researchers who have, in addition, pointed out the interaction between difficulty of material and intelligence. Goldstein (10), after studying reading and listening comprehension of adult males using reading test material, concluded that the relative superiority of listening comprehension over reading comprehension diminishes with increased difficulty of material. Listening may be superior for easy materials. However, for difficult materials the two modes may yield equivalent results. Throughout, the difference in favor of listening comprehension is greater for the less intelligent subjects.

The effects of length of material were studied by Carver (2) who found listening superior to reading for pupils in grades 4 and 6. In his conclusions Carver states, "The relationship between listening and reading comprehension does not appear to be altered by length of passage."

From the foregoing discussion, it can be inferred that the variables which effect the relative efficiency of comprehension by reading and listening are much the same as those related to listening comprehension itself. It is highly likely that these variables will also be related to comprehension of speeded speech as compared with that of Braille reading. Therefore, they must be taken into account in any research planned in this area.

Several additional problems should be considered for research. No information is available concerning the relative amounts of fatigue induced by reading and listening. In almost all studies on these topics practice periods have been short. In personal contacts with blind persons by the speaker, some comments have indicated that greater fatigue is experienced in listening than in reading. Another factor receiving little attention is the relative efficiency of both modes of communication. Even if reading comprehension exceeds that of speeded speech, the fact that it may take four times as long to read as to listen may be significant. Listening two or three times to material may give as much comprehension as a single reading yet still result in a saving of time. The effectiveness of learning resulting from combinations of Braille and speeded auditory materials should also be explored. For example, a Braille outline supplemented by a speeded auditory text might prove an effective combination.

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